1. List one advantage and one disadvantage of connectionless protocols over protocols that maintain connections. (4)

2. What is an SQL injection attack? Explain how it works and what precautions must be taken to prevent them. (6)

3. Suppose there are two relations r and s, such that the foreign key B of r references the primary key A of s. Describe (note: you do not have to implement!) how the trigger mechanism can be used to implement the on delete cascade option when a tuple is deleted from s. (4)
4. Consider the relation $R = (A, B, C, D, E, F, G)$ with the domain of each attribute is integer and the functional dependencies $\mathcal{F} = \{BE \rightarrow CD, G \rightarrow AEF, C \rightarrow B\}$.

(a) Find the candidate keys for $R$ (10)

(b) Find a 3NFLJDP decomposition for $R$ using the algorithm presented in class. (10)
(c) Is your decomposition from Part b also in BCNF? Prove or disprove your answer. (10)

(d) Find $CE^+$. (10)

5. List Armstrong’s Axioms, providing the definition of each. (6)
6. People have many interesting relationships. People can be parents, and children. People can be siblings (brother/sister) and people can be married to each other. People also have a set of names (legal names, nicknames, married names, etc), date of birth (and the computed age), and for the purposes of our model, a unique identifier called Uid.

Create an ER-diagram to represent people and these relationships.
7. Create an ER-diagram of the strong entity Patients with the weak entity Tests. All patients have pID, and for every patient, a test has a text field with the information about the test, a timestamp, and are numbered starting from 1 for each patient.
8. Show the SQL statement to create the test table from Question 7. (10)

9. Compare and contrast the use of a view, materialized view, temporary table and derived relation. Give an example as to why you would use each one. (10)